Reliability Report

TLV1H103-SEP Production Flow and Reliability Report

ABSTRACT

This report presents the reliability and qualification results for the TLV1H103-SEP, which is a 325MHz high-speed comparator with rail-to-rail inputs and a propagation delay of 2.5ns in SEP (Space Enhanced Plastic). The TLV1H103-SEP is manufactured with a controlled baseline and has the following:

- One Assembly and Test Site
- Product Traceability
- An Extended Product Life Cycle

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Trademarks

1 Texas Instruments Enhanced Product Qualification and Reliability Report

TI qualification testing is a risk mitigation process that is engineered to maintain device longevity in customer applications.

Wafer fabrication process and package level reliability are evaluated in a variety of ways that can include accelerated environmental test conditions with subsequent derating to actual use conditions.

Manufacturability of the device is evaluated to verify a robust assembly flow and maintain continuity of supply to customers.

TI Enhanced Products are qualified with industry standard test methodologies performed to the intent of Joint Electron Devices Engineering Council (JEDEC) standards and procedures.

Texas Instruments Enhanced Products meet GEIA-STD-0002-1 Aerospace Qualified Electronic Components.

2 Space Enhanced Plastic Production Flow

2.1 Device Introduction

TLV1H103-SEP is a radiation hardened device in a plastic package which allows this device to be used in space applications.

The device was verified immune to 43 MeV·cm^2/mg at 125°C for single event latchup. Each Fab lot was tested according to MIL-STD-883 for Radiation Lot Acceptance Test (RLAT) up to 30 krad(Si) and each assembly and test lot goes thru the process flow as shown in the Space Enhanced Plastic Production Flow Chart .

To maintain the quality of TLV1H103-SEP, the device is qualified to the Space EP (SEP) requirement, which is explained in the Device Qualification section.

2.2 Space Enhanced Plastic Production Flow Chart

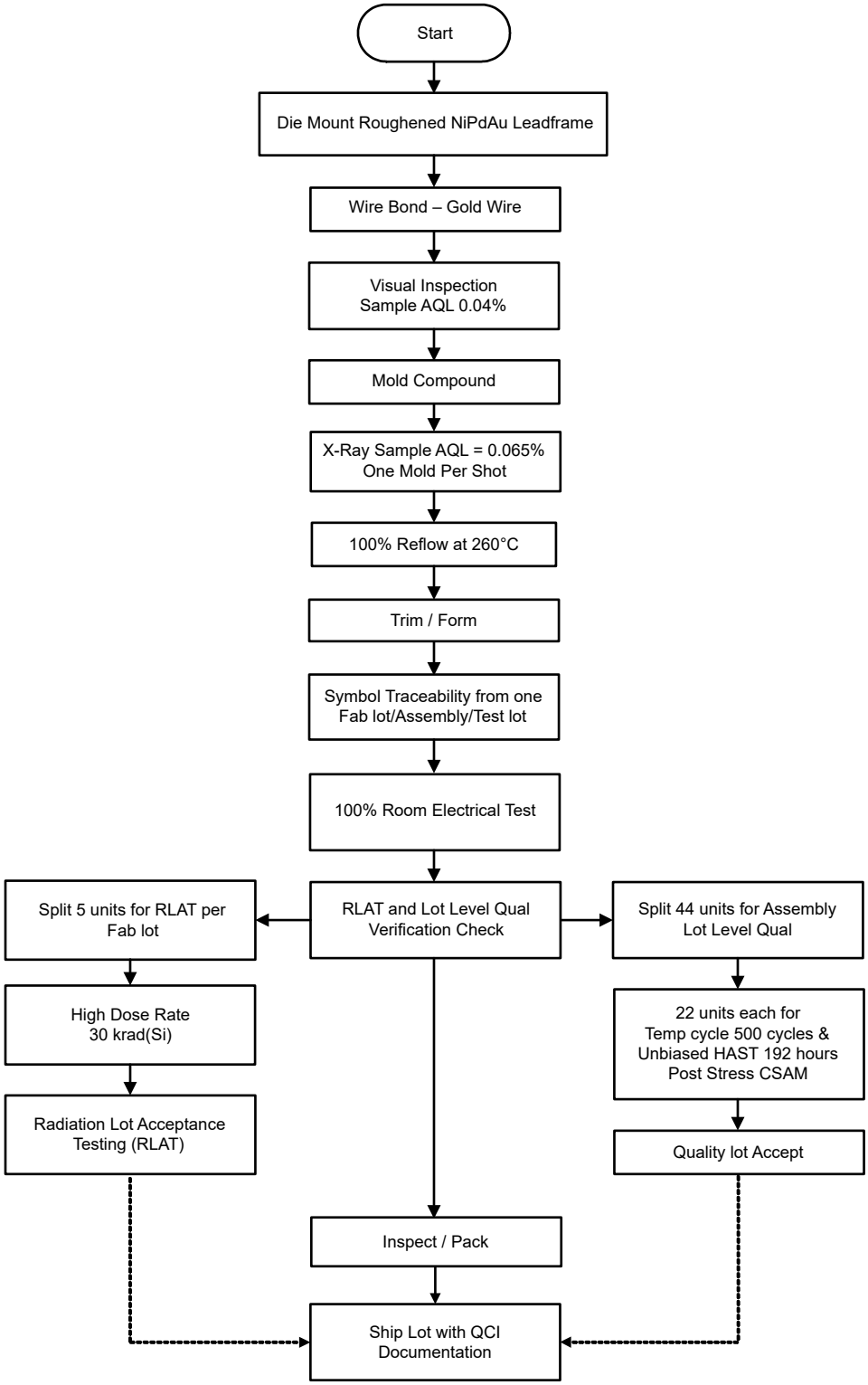

Figure 2-1. Space Enhanced Plastic Production Flow Chart

3 Device Qualification

The following is the device qualification summary:

Qualification by Similarity (Qualification Family)

A new device can be qualified either by performing full scale quality and reliability tests on the actual device or using previously qualified devices through "Qualification by Similarity" (QBS) rules.

By establishing similarity between the new device and those qualified previously, repetitive tests can be eliminated, allowing for timely production release. When adopting QBS methodology, the emphasis is on qualifying the differences between a previously qualified product and the new product under consideration.

The QBS rules for a technology, product, test parameters or package shall define which attributes are required to remain fixed for the QBS rules to apply.

The attributes which are expected and allowed to vary are reviewed and a QBS plan shall be developed, based on the reliability impact assessment above, specifying what subset of the full complement of environmental stresses is required to evaluate the reliability impact of those variations.

Each new device shall be reviewed for conformance to the QBS rule sets applicable to that device. See JEDEC JESD47 for more information.

Table 3-1. Space Enhanced Products New Device Qualification Matrix

Note that qualification by similarity (*qualification family*) per JEDEC JESD47 is allowed.				
Description	**Condition**	**Sample Size Used/ Rejects**	**Lots Required**	**Test Method**
Electromigration	Maximum Recommended Operating Conditions	N/A	N/A	Per TI Design Rules
Wire Bond Life	Maximum Recommended Operating Conditions	N/A	N/A	Per TI Design Rules
Electrical Characterization	TI Data Sheet	30	3	N/A
Electrostatic Discharge Sensitivity	HBM Per TI Data sheet	3 units/voltage	1	JEDEC JS-001 or EIA/JESD22-A114
	CDM Per TI Data sheet			JEDEC JS-002 or EIA/JESD22-C101
Latch-up	Per Technology	3/0	1	EIA/JESD78
Physical Dimensions	TI Data Sheet	30/0	1	EIA/JESD22- B100
Bias Life Test	125°C / 1000 hours or equivalent	77/0	3	JESD22-A108(1)
Biased HAST	130°C / 85% / 96 hours	77/0	3	JESD22-A110/A101(1)
Extended Biased HAST or equivalent	130°C / 85% / 250 hours (for reference)	77/0	1	JESD22-A101/A101(1)
Unbiased HAST	130°C / 85% / 96 hours	77/0	3	JESD22-A.118(1)
Temperature Cycle	–65°C to +150°C non-biased for 500 cycles Or equivalent	77/0	3	JESD22-A104(1)
Solderability	Bake Preconditioning	22/0	1	ANSI/J-STD-002
Bond Shear	Per wire size	5 units × 30/0 bonds	3	JESD22-B116
Bond Pull Strength	Per wire size	5 units × 30/0 bonds	3	ASTM F-459
Die Shear	Per die size	5/0	3	MIL-STD-883, TM 2019
High Temp Storage	175°C / 420 hours	77/0	3	JESD22-A103(1)
Moisture Sensitivity	Surface Mount Only	12	3	J-STD-020(1)
Radiation Response Characterization	Per TI Data sheet	5 units/dose level	1	MIL-STD-883/Method 1019
Outgassing Characterization	TML <=1% (Total Mass Lost) CVCM <=0.1% (Collected Volatile Condensable Material)	5	1	ASTM E595

(1) Precondition performed per JEDEC Std. 22, Method A112/A113.

3.1 Outgas Test Report

Outgassing test was performed on 5 units. A total mass loss (TML) of 1.00% and collected volatile condensable material (CVCM) of 0.10% were used as screening levels for rejection of spacecraft materials. The outgas test was performed in a vacuum environment of less than 5×10^{-5} torr according to ASTM E 595, for a duration of 24 hours, at 125°C. The TML, CVCM, and the amount of Water Vapor Recovered (WVR) were measured after the test.

Table 3-2. Outgas Test Results

SAMPLE	TML < 1.0%	CVCM < 0.1%
TLV1H103MDBVTSEP	PASS	PASS

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